

PRACTICAL NOTE BOOK OF CHEMISTRY

FOR CLASS IX X



PUBLISHED BY

Malik Sirajuddin & Sons, Lahore (8)

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PRACTICAL

Note Book of Chemistry

for

CLASS IX—X



Published by :

Malik Sirajuddin & Sons

KASHMIRI BAZAR, LAHORE (8)

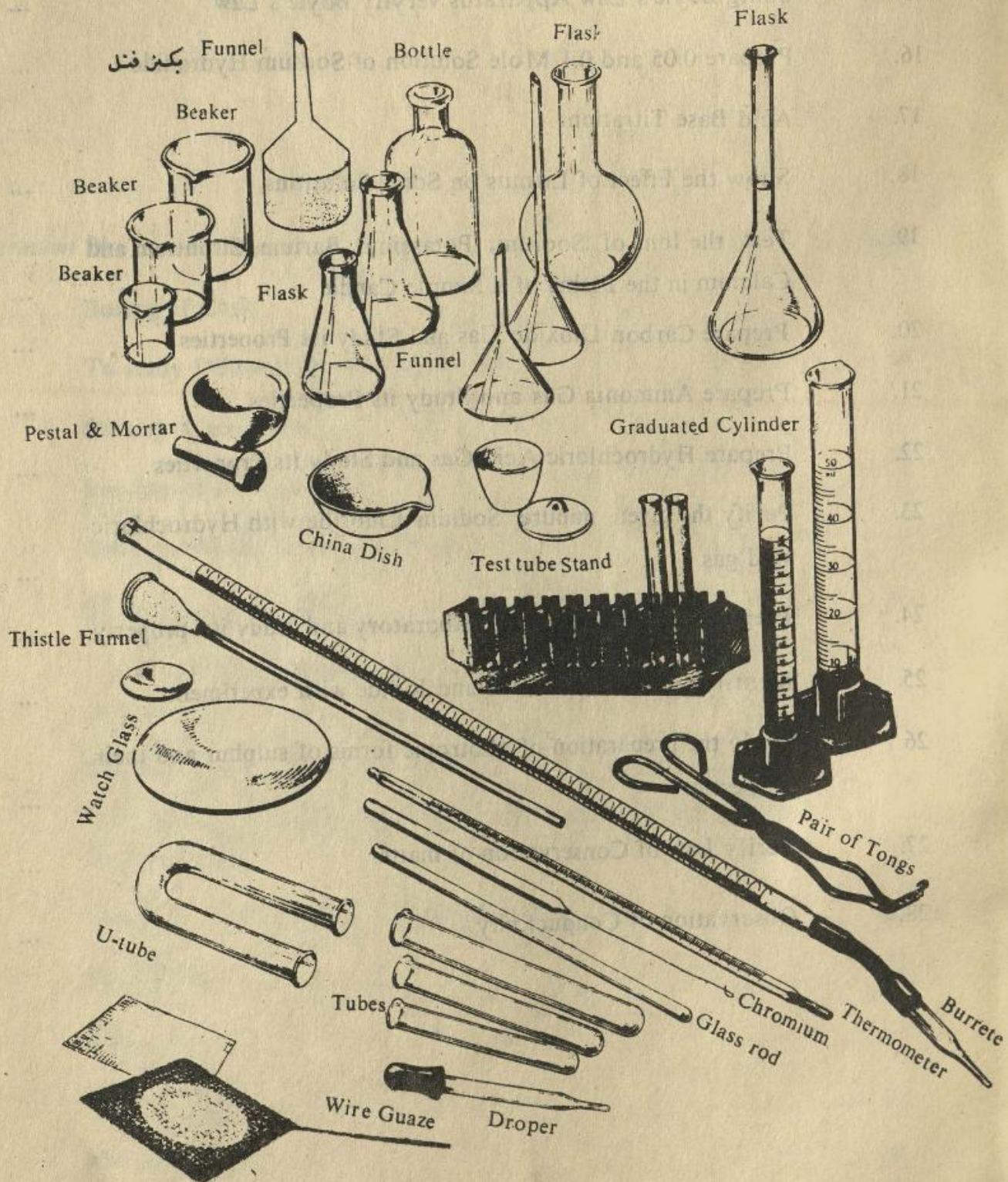
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Instruments that are used in the Laboratory



EXPERIMENT 1

BASIC SIMPLE RULES OF LABORATORY

BORING OF CORK

Apparatus.

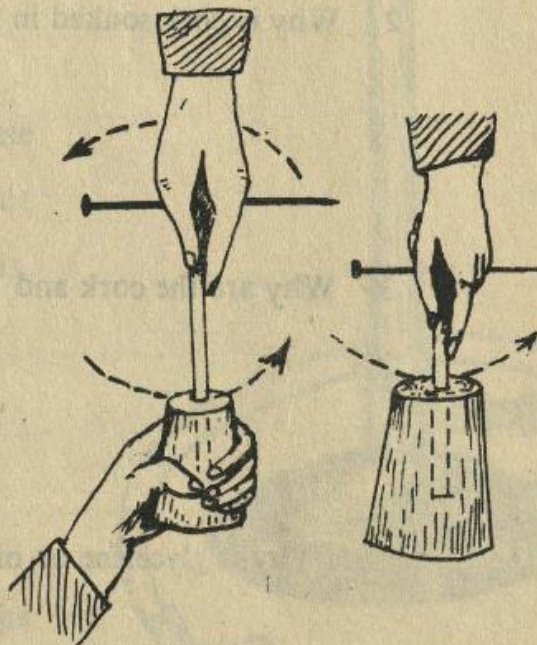
Cork, Cork borer. Round file, Glycerine.

Procedure.

Dip the cork in water and hold it tightly with its broad side placed on the table. On the narrower side of the cork place the sharp edge of the cork borer moistened with glycerine. Rotate the borer keeping it pressed, in the clock-wise direction. When the cork borer reaches the broader end of the cork, then rotate it in the anti-clockwise direction to take it out of the cork. Smoothen the hole with a round file.

Precautions.

1. Before drilling a hole through the cork, dip it in water.
2. Keep the cork and the corkborer vertical while the borer is being pressed and rotated in the clock wise direction.



3. Remove the cut away cork, left inside the hole, with a rod.
4. Apply glycerine or any other oily liquid on the sharp edge of the borer so that the cork does not break.

Practical Work.

Drill holes through cork of different sizes.

QUESTIONS :

1. Why is the cork borer rotated while drilling hole in the cork ?
2. Why is cork soaked in water ?
3. Why are the cork and the cork borer held vertical ?
4. Why is glycerine or oil applied at the sharp end of the cork borer ?

EXPERIMENT 2

TO STUDY DIFFERENT PARTS OF THE FLAME

1. Lower Yellow Part of the Flame :

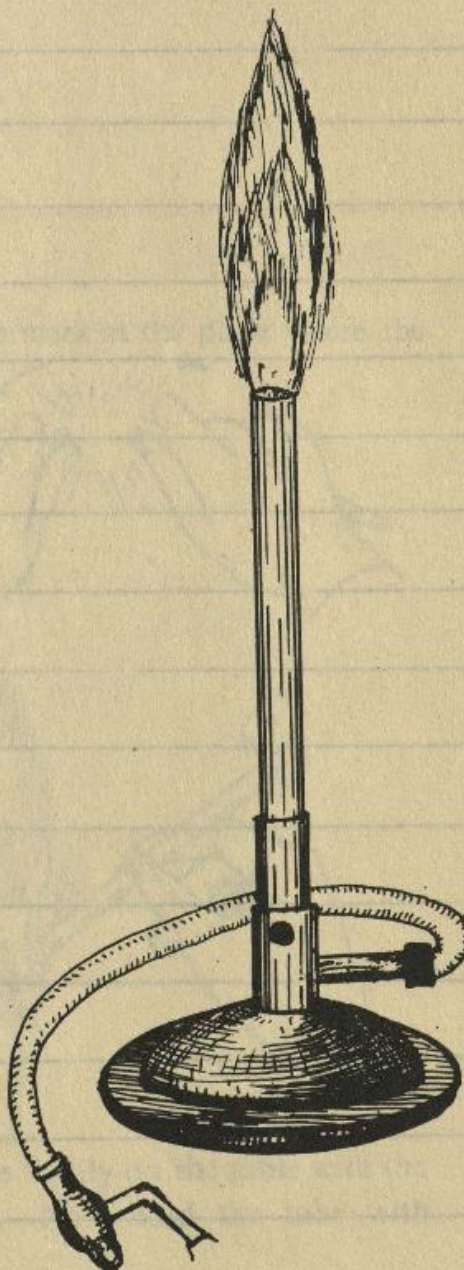
There is plenty of air in the lower part. Here the process of burning does not take place. The flame appears to be bluish yellow in this part.

2. Hottest Part of the Flame :

Here the process of burning is complete and is the hottest part of the flame. This part is invisible. The body to be heated is kept in this part of the flame.

3. Light Pink Yellow Part of the Flame :

This is the light pink yellow part of the flame. It appears to be light yellow in colour.



[illegible]

EXPERIMENT

3

CUTTING OF THE GLASS

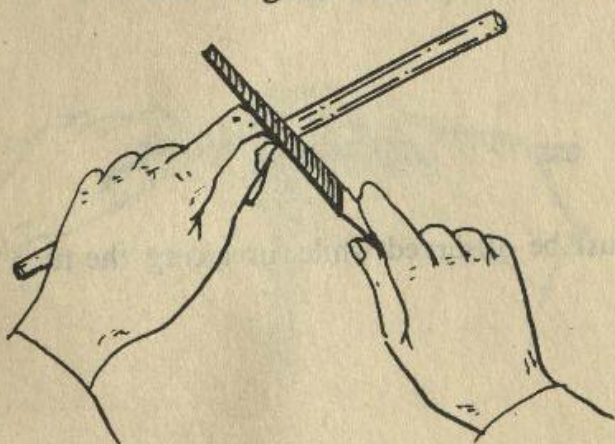
Apparatus.

Tube, triangular file, spirit lamp, match box.

Procedure.

Place the glass tube on the table.

Etch a deep mark at the place where the



tube is to be cut with a triangular file. Hold the tube tightly on the table with the left hand rubbing the triangular file at the etched mark. Now hold the tube with

both hands, the two thumbs being nearer to the mark and press the tube a little at the mark to break it. Now heat the tube in the outer part of the flame as shown in figure to make the edges of the tube round.

Precautions.

1. The file should be rubbed in one direction only.
2. Etch mark on one side of the tube and exert pressure.

Practical Work.

Cut the tubes in different sizes.

QUESTIONS :

1. Why is the tube etched with the file at one place only ?
2. What are the precautions that must be observed while breaking the tube ?
3. If the mark on the tube is not etched deep then what will happen ?
4. What will happen if a wet glass tube is heated on a spirit lamp ?

EXPERIMENT 4

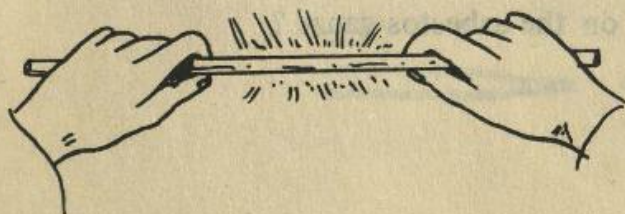
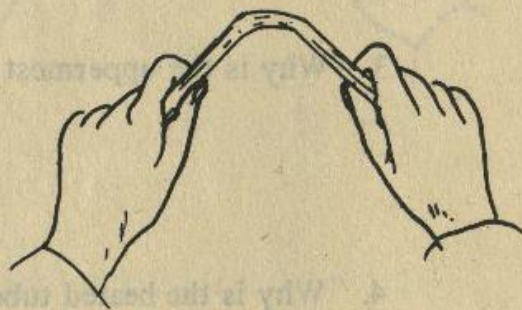
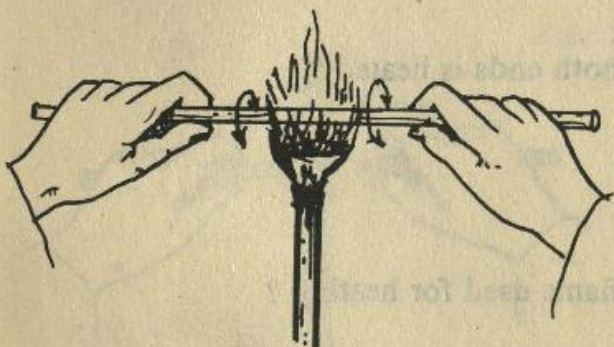
BENDING OF A GLASS TUBE

Apparatus.

Glass tube, Spirit lamp, Match box, Asbestos gauze.

Procedure.

Heat that part of the tube where it is required to be bent over the flame of the spirit lamp. Use the uppermost part of the flame. Keep the tube rotating in



the flame till it becomes red hot and softens. Bend it according to need. While bending take it out of the flame and place it on the asbestos gauze.

Precautions.

1. Use the uppermost part of the flame.
2. Keep on rotating the tube throughout.
3. Place the heated tube on an asbestos gauze.
4. The tube must be clean and dry.

QUESTIONS :

1. What will happen if a wet tube is heated over a flame ?
2. What will happen if a tube closed both ends is heated ?
3. Why is the uppermost part of the flame used for heating ?
4. Why is the heated tube placed on the asbestos gauze ?
5. Why does the tube sometimes crack while heating ?

EXPERIMENT 5

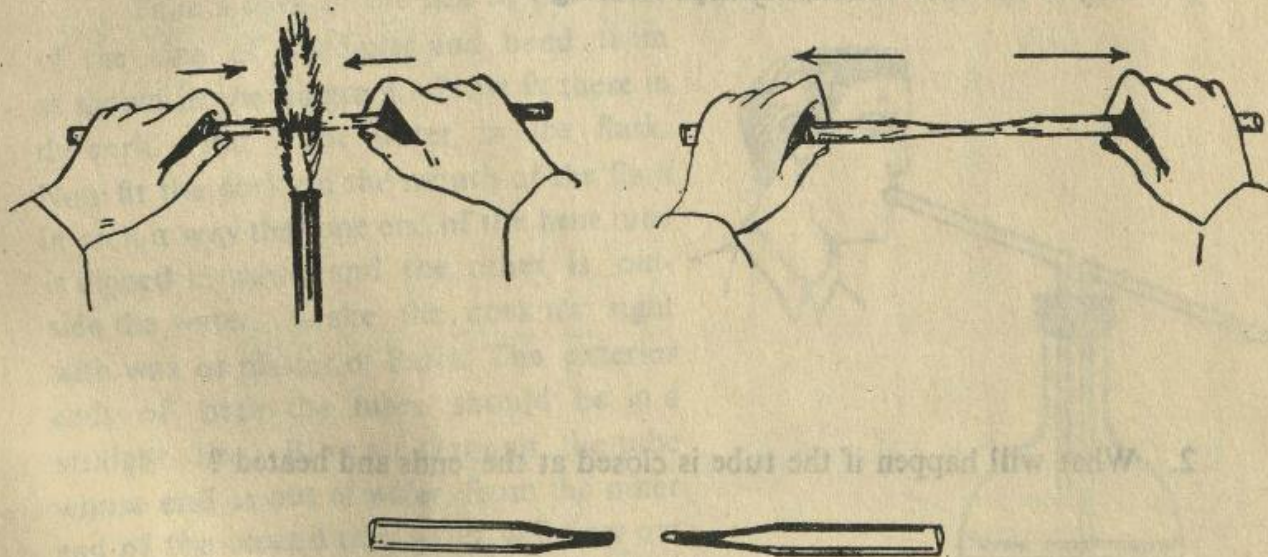
DRAWING THE JET OF A GLASS TUBE

Apparatus.

Glass tube, Spirit lamp, Match box.

Procedure.

While heating, during process of drawing of a jet, pull the tube gently when it



gets red hot, so that the red part of the tube gets elongated and pointed. Break it at the centre to make two tubes. Each pointed tube becomes a jet.

Precautions.

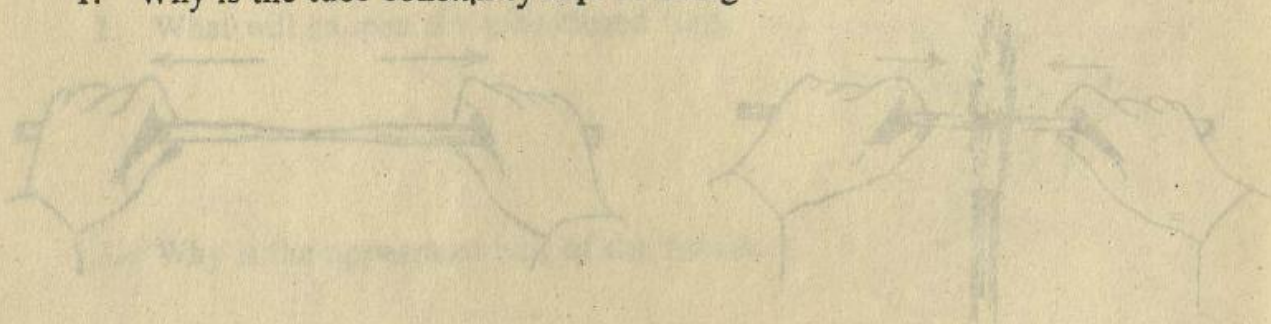
1. Throughout the process of heating keep the tube rotating slowly.
2. Pull the tube from the ends outward.
3. Use the uppermost part of the flame.

Practical Work.

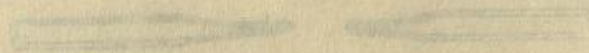
Make a dropper.

QUESTIONS :

1. Why is the tube constantly kept rotating ?



2. What will happen if the tube is closed at the ends and heated ?



EXPERIMENT 6

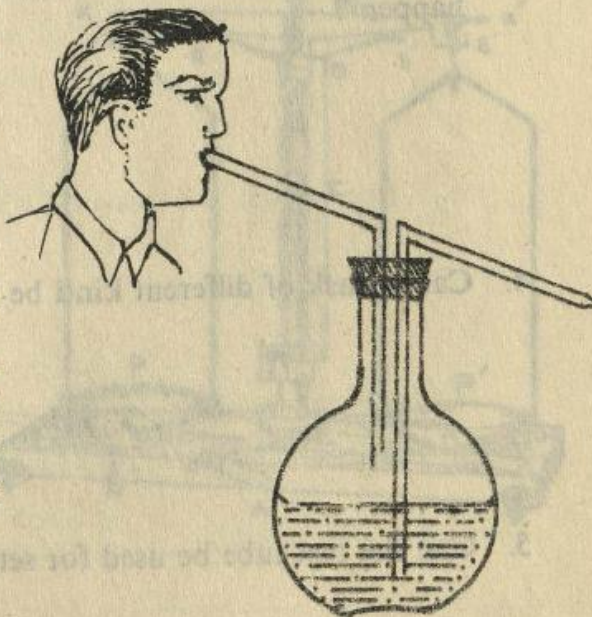
TO SET UP A WASH BOTTLE

Apparatus.

Glass tube, Spirit lamp, Match box, Cork, Cork borer, Round file, Glycerine.

Procedure.

Take a cork of the size of the flask, and bore two holes in it. Select two tubes of the size of the holes and bend them as shown in the diagram. Now fit these in the cork. Put some water in the flask. Now fit the cork on the mouth of the flask in such a way that one end of the bent tube is dipped in water and the other is outside the water. Make the cork air tight with wax or plaster of Paris. The exterior ends of both the tubes should be in a straight line. Blow air through the tube whose end is out of water, from the other end of the second tube water will flow out of the jet with a great speed.



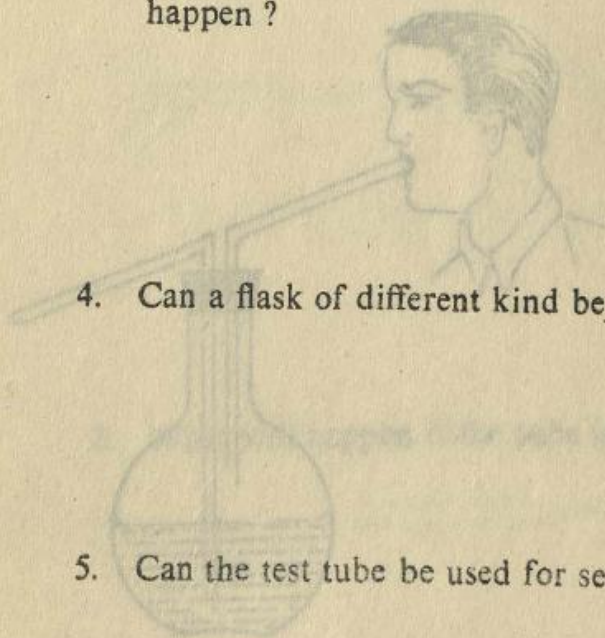
Precautions.

1. Make the cork air tight with wax or plaster of Paris.
2. The outer arms of the tube should be in a straight line.

3. The pointed end of the tube should be immersed in water while the other end should be out of it.
4. The ends of the tubes inside the flask should be round.

QUESTIONS :

1. Are the tubes bent at particular angles ?
2. Why is one tube immersed in water and the other is kept out of it.
3. If we blow through a tube whose other end is dipped in water, what will happen ?
4. Can a flask of different kind be used for making a wash bottle ?
5. Can the test tube be used for setting up a wash bottle ?



EXPERIMENT 7

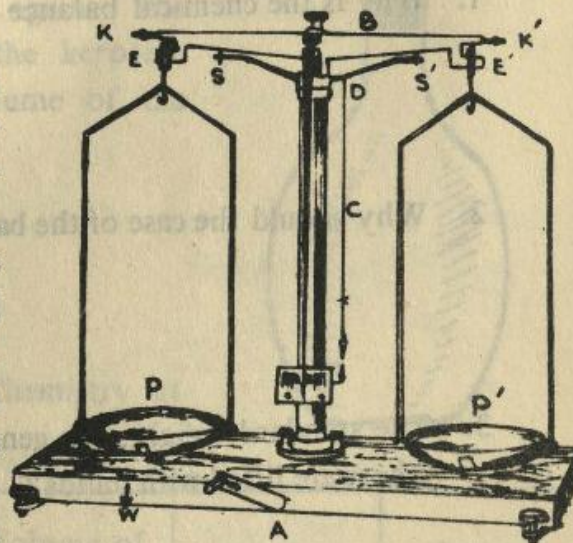
USE OF A SIMPLE CHEMICAL BALANCE AND TO FIND THE WEIGHT OF A COIN.

Apparatus.

Balance, Weight box, Coin.

CHEMICAL BALANCE

Like an ordinary balance it has a beam B. It is housed in a glass case. At the ends of the beam two scale pans P and P' are suspended by the sharp edged supports K and K'. Normally the beam rests on the supports SS' and the pans rest on the base W. When the knob (screw) A is rotated then a rod D inside the pillar C moves upward and the sharp edged end of beam B lifts off the supports SS'. The pans too get lifted off the base. In this position if the weight of the two pans is equal then the beam remains horizontal and the pointer T will be on the zero of the scale. If it is not so, the screw E and E' are moved a little forward or backward till the beam becomes horizontal. Now the body to be weighed is placed in the left hand pan and the standard weights are put in the right hand pan.



WEIGHT OF THE COIN

Place the given coin in the left hand pan and the standard weights in the right hand pan. Handle the weights with a tweezer. Compare the weight of this coin with the weight of a standard coin.

Observations.

Sr.No.	Weight of the given coin	Weight of the standard coin	Difference
1.			
2.			
3.			

Precautions :

1. Always weigh after levelling the balance.
2. Always handle weights with a tweezer.

QUESTIONS :

1. Why is the chemical balance levelled ?

2. Why should the case of the balance be closed with glass lid ?

3. The standard weights are generally lifted with a tweezer. What is the harm if these are lifted with hands ?

4. Why are the weights neither put nor taken out when the pans are raised ?

EXPERIMENT 8

TO FIND THE DENSITY OF SUBSTANCES WITH A SPECIFIC GRAVITY BOTTLE AND TO COMPARE THIS DENSITY WITH STANDARD DENSITY AND FIND THE PERCENTAGE

Apparatus :

Kerosene oil, Balance, Weight box, Specific gravity bottle, Beaker.

Procedure :

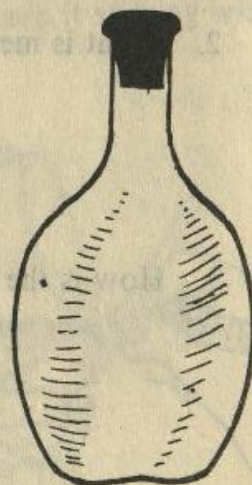
Clean the bottle and dry it. Bring the balance in equilibrium. Weigh the specific gravity bottle with the stopper. Fill it with kerosene oil and insert the stopper gently into it. Wipe the specific gravity bottle dry from outside and weigh it again. The difference of two weights gives the weight of the kerosene oil. The volume of the oil is equal to the volume of the bottle which is written on it.

$$\text{Density} = \frac{\text{Weight of oil}}{\text{Volume of oil}} = \dots \dots \text{gm/cm}^3$$

Observations :

(For details study Textbook of Chemistry at

page 12.)



Sr. No.	Weight of empty bottle	Weight of bottle + oil	Weight of oil	Volume of oil	Density	Percent

Precautions :

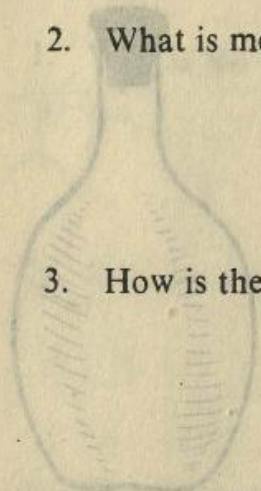
1. There should be no bubble of air in the oil.
2. Fix the stopper gently in the bottle.
3. Dry the bottle from outside before weighing.

Practical work :

Find the density of (a) acetone (b) milk.

QUESTIONS :

1. What is the difference between mass and weight ?
2. What is meant by volume ? What are the units in which this is expressed ?
3. How is the density of a solid found ?
4. What is the difference between density and relative density (specific gravity) ?



Weight of empty bottle	Weight of bottle + oil	Weight of bottle + water	Volume of oil	Density	Relative Density

5. If air bubbles are present in the liquid of specific gravity bottle then what will be its effect on the density of the liquid ?

EXPERIMENT 9

METHODS OF PURIFYING AN IMPURE SUBSTANCE

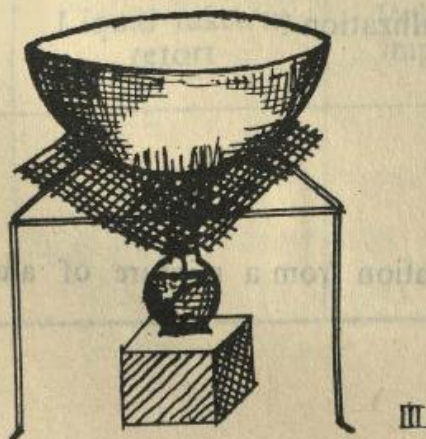
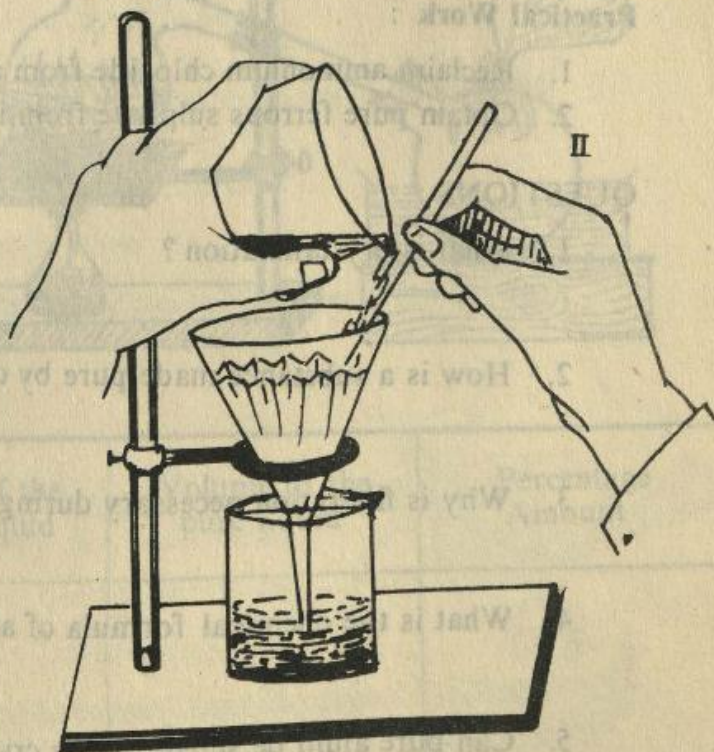
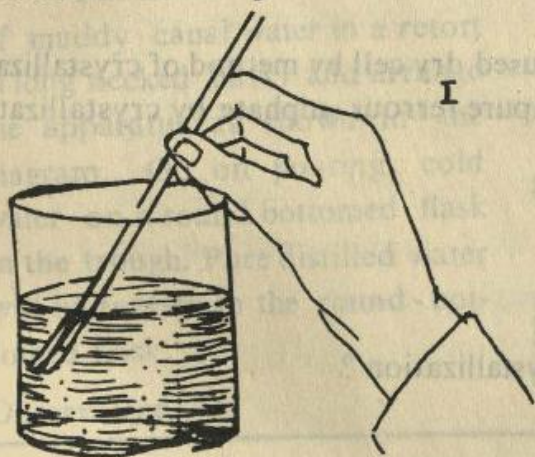
(a) To purify by the method of crystallization. Purify impure alum by method of crystallization.

Apparatus :

Beaker, Impure alum, Spirit lamp, Tripod, Gauze, Stand, Filter paper, Funnel, Glass rod, Porecelain dish and Match box.

Procedure :

Take some water in a clean beaker. Take about 5 to 10 grams of alum and powder it. Go on adding a little of powder in water and keep it stirring with a glass rod as shown in Fig. 1.



When the powdered alum no longer dissolves in water at room temperature, then filter this solution. This solution is the saturated solution of alum. Heat this filtered solution in an open dish till it becomes thick. Let this thick solution cool. Alum crystals will be visible at the bottom of the dish. Separate the liquid by decantation and dry the crystals on a filter paper. Heat the decanted liquid again and let it again cool. Some more crystals will be visible at the bottom. Dry these crystals on the filter paper.

Observations :

Sr. No.	Weight of the substance	Weight of the first crystals	Weight of the second crystals	Mean	Percentage Amount

Precautions :

1. The beaker and the glass rod must be clean.
2. Add a little of alum at a time and go on stirring.

Practical Work :

1. Reclaim ammonium chloride from a used dry cell by method of crystallization.
2. Obtain pure ferrous sulphate from impure ferrous sulphate by crystallization.

QUESTIONS :

1. What is crystallization ?
2. How is a substance made pure by crystallization ?
3. Why is filtration necessary during crystallization ?
4. What is the chemical formula of alum ?
5. Can pure alum be separated by crystallization from a mixture of alum and common salt. If not, why not ?

EXPERIMENT 10

DISTILLATION

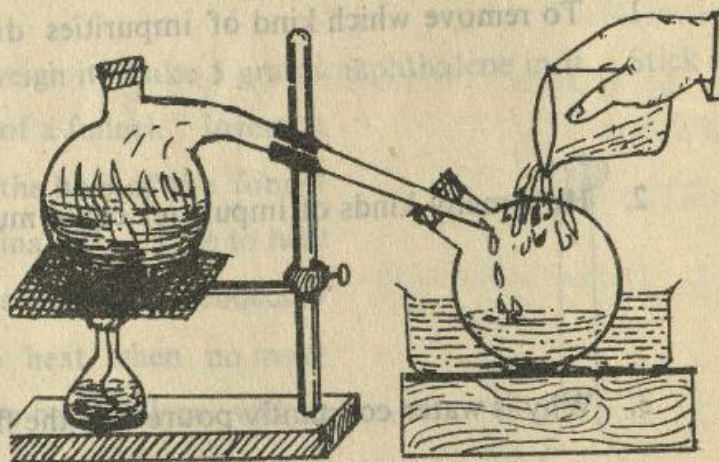
Obtain pure water from muddy canal water.

Apparatus :

Retort, Stand, Spirit lamp, Wire gauze, Round bottomed flask, Beaker, Trough, Test tubes and Muddy canal water.

Procedure :

Put about 50 to 100 grams of muddy canal water in a retort (a long necked flask) and arrange the apparatus as shown in the diagram. Go on pouring cold water on a round bottomed flask in the trough. Pure distilled water will be formed in the round bottomed flask.



Observations :

Sr. No.	Liquid taken in retort	Volume of the impure liquid	Volume of the pure liquid	Percentage Amount

Precautions :

1. Besides putting muddy canal water put some small bits of glass or china dish in the retort.
2. Take enough water in the trough to dip the round bottomed flask in it.
3. When the vapours begins to escape out of the retort, then keep on pouring cold water on the flask.

Practical Work :

1. Obtain pure colourless water from a coloured water containing potassium permanganate.
2. Obtain pure water from the water taken from (a) well (b) river (c) pool and (d) sea, by distillation process.

QUESTIONS :

1. To remove which kind of impurities distillation process is used ?
2. How many kinds of impurities could muddy canal water have ?
3. Why is water constantly poured on the flask ?

4. Why should the neck of the flask be long ?

5. What will happen if small pieces of glass or china dish are not put in the retort besides the muddy canal water ?

EXPERIMENT 11

SUBLIMATION

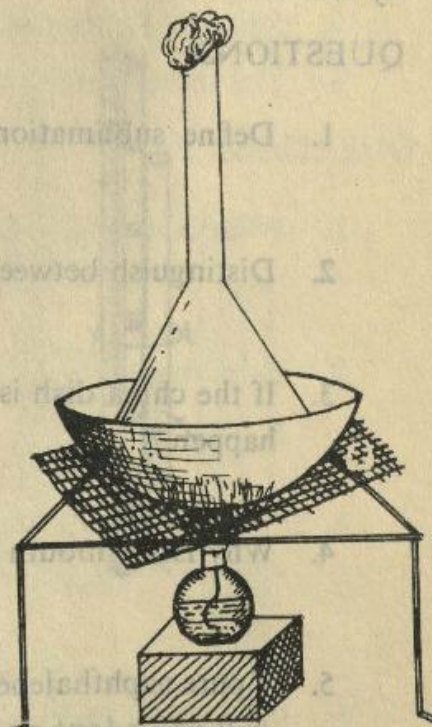
By Sublimation get pure naphthalene from impure naphthalene. Calculate the percentage amount.

Apparatus :

Impure naphthalene, Tripod, Wire gauze, Match box, Spirit lamp, Funnel, Filter paper, China dish, Cotton and Carbon disulphide.

Procedure :

1. Clean a china dish and weigh it. Take 5 grams naphthalene in it. Stick a wet filter on the inside surface of a funnel. Invert it over the china dish. Plug the hole of the funnel with cotton. Heat the china dish. Due to heat naphthalene converts into vapours and is collected on the filter paper. Stop heat when no more vapours are formed. Pure naphthalene will be found sticking to the filter paper. Find the percentage amount of it.
2. Take 5 gram naphthalene dissolved in carbon disulphide. Take carbon disulphide in a beaker and adding a little naphthalene stir the liquid. Place the solution in an open space. Carbon disulphide will vaporise leaving naphthalene behind in the dish. Find the weight of naphthalene and find the percentage amount. Compare the two methods.



Observations :

Method	Weight of china dish	Weight of china-dish and impure substance	Weight of china dish after sublimation	Weight of china dish after vaporisation	Percentage amount
Sublimation					
Vaporisation					

Precautions :

1. Place the funnel on the china dish in such a way that no vapour escapes.
2. Heat the dish slowly and gently.

Practical Work :

Separate ammonium chloride from a mixture of sand and ammonium chloride by sublimation.

QUESTIONS :

1. Define sublimation.
2. Distinguish between sublimation and vaporisation.
3. If the china dish is heated without placing it on a wire gauze, what will happen?
4. Why is the mouth of the funnel plugged with cotton or piece of paper?
5. If pure naphthalene is to be recovered from impure naphthalene which method will you adopt and why?

EXPERIMENT 12

BOILING POINT

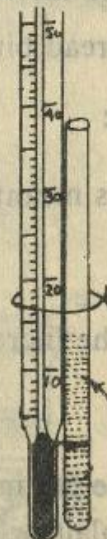
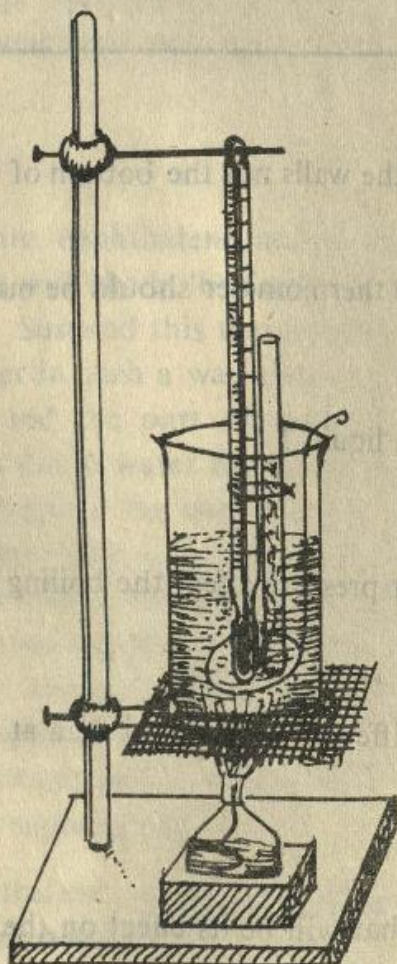
Find the boiling point of pure and impure water.

Apparatus :

Spirit lamp, Match box, Tripod, Wire gauge, Beaker, Thermometer, Sulphuric acid, Thread, Narrow glass tube, Pure and impure water.

Method :

Take some pure water in a tube. Tie this tube by a thread with a thermometer. The lower end of the tube and the stem of thermometer should be in the same level.



Dip the tube containing water and the thermometer in a beaker. The upper end of the tube must be outside the liquid in the beaker. The liquid in the beaker should either be sulphuric acid or any other liquid whose boiling point is above the boiling point of water. Heat the beaker. Note the temperature on the thermometer when bubbles begin to escape violently out of the narrow glass tube. This temperature is the boiling point of pure water. Repeat the experiment for impure water (Study Textbook of Chemistry at page 79).

Observations :

Boiling point of pure water	Boiling point of impure water	Difference

Precautions :

1. Thermometer should neither touch the walls nor the bottom of beaker.
2. Suspend thermometer by a stand.
3. The thread binding the tube and the thermometer should be outside the acid,

QUESTIONS :

1. What is meant by boiling point of a liquid ?
2. Does the increase or decrease of air pressure affect the boiling point ?
3. Will the boiling point of water be different at Karachi than at Murree ? If so, explain why ?
4. If some salt is dissolved in water, what will be its effect on the boiling point of water ?

EXPERIMENT

13

MELTING POINT

Determine the melting point of pure and impure naphthalene.

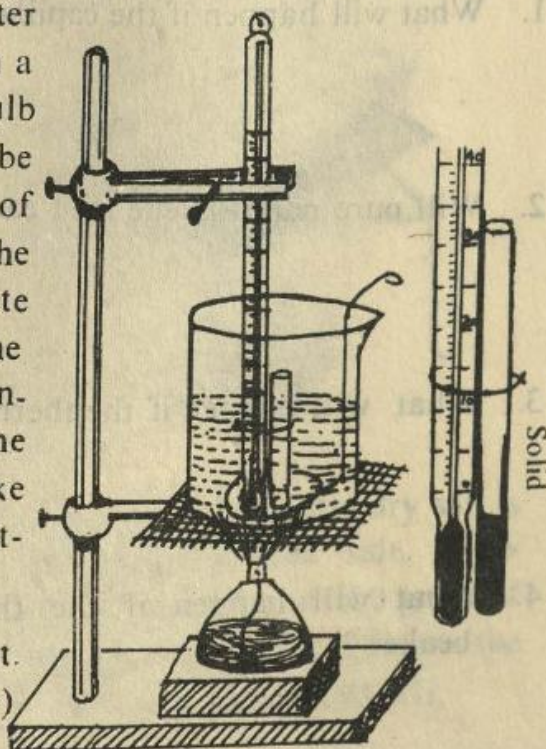
Apparatus :

Thermometer, thread, capillary tube, beaker, water, stand, spirit lamp, wire gauze, given solids whose melting point is to be determined (pure and impure naphthalene).

METHOD :

Take some impure naphthalene and powder it. Put some of this powder in a capillary tube. Tie this with the bulb of a thermometer as shown in figure. Suspend this thermometer in a beaker containing water in such a way that the bulb of the thermometer and the part of capillary tube containing the powder dip in water but the mouth of the capillary is much above the level of water in the beaker. Heat the beaker with a spirit lamp. Note the temperature on the thermometer. Stop heating the beaker, when naphthalene in the tube appears to contract. Stir water to cool it. When naphthalene becomes transparent, again note the temperature. Take the mean of the two temperatures. This is the melting point of the given naphthalene.

Taking pure naphthalene, repeat the experiment. (For details consult Textbook on Chemistry page 84)



Observations :

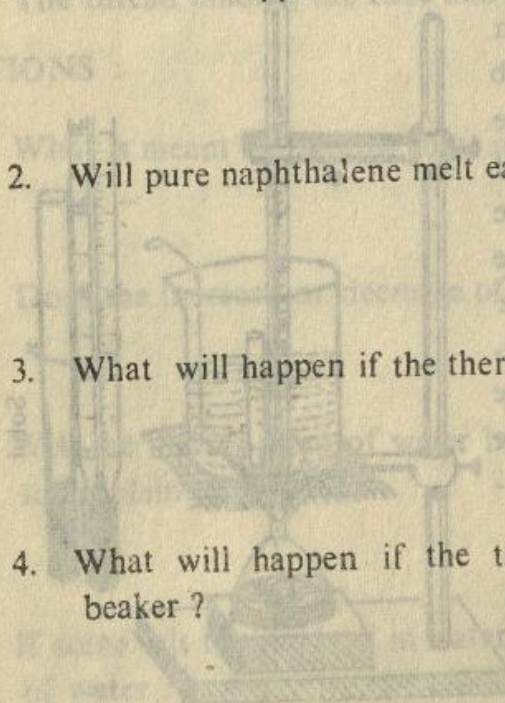
Name of the substance	Temperature at which naphthalene contracts	Temperature at which naphthalene becomes transparent	Mean temperature
Impure naphthalene			
Pure naphthalene			

Precautions :

1. While suspending thermometer, the scale should face you.
2. Thermometer should neither touch the walls nor the bottom of the beaker.
3. Do not dip the capillary tube completely in water.
4. Immediately note the temperature when the solid begins to contract or it begins to be transparent.

QUESTIONS :

1. What will happen if the capillary tube is completely dipped in water ?
2. Will pure naphthalene melt earlier (at a lower temperature) ?
3. What will happen if the thermometer scale is not facing you ?
4. What will happen if the thermometer touches the walls or the bottom of the beaker ?



EXPERIMENT 14

FINDING THE SOLUBILITY

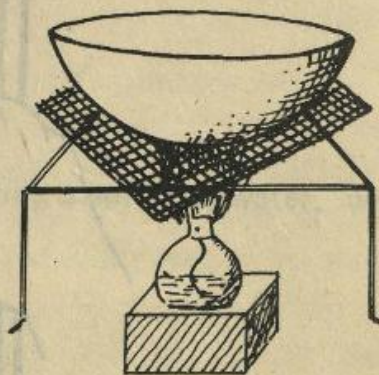
Find the solubility of table salt at room temperature.

Apparatus :

Table salt, water, beaker, spirit lamp, wire gauze, apparatus for filtration, china dish, balance, weight box.

METHOD :

Take some water in a clean beaker. Go on adding some salt after regular intervals till a saturated solution of salt is formed at room temperature. Filter this solution. Now take a china dish and weigh it. Put saturated solution in it and again weigh it. Taking the difference of the two weights, find the weight of saturated solution



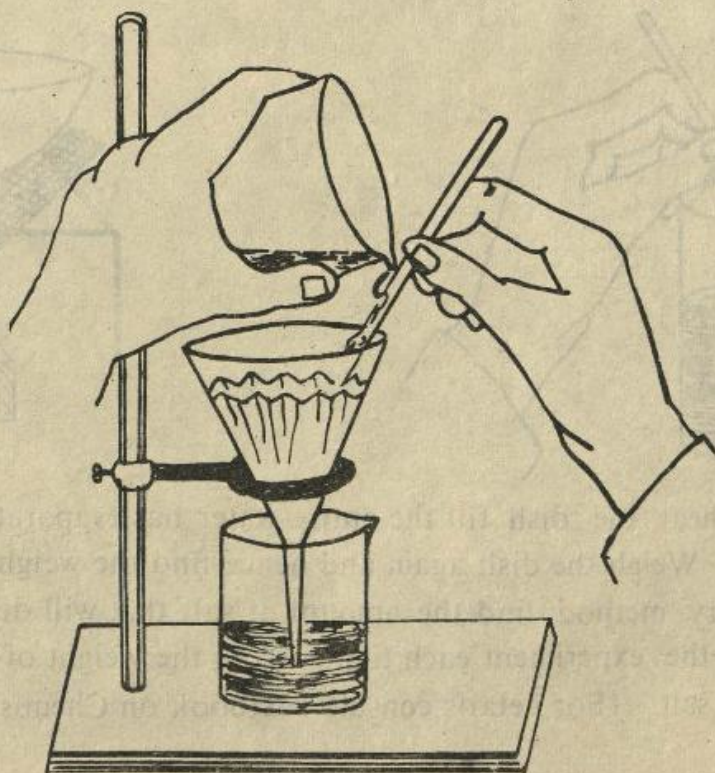
of salt. Now heat the dish till the entire water has evaporated and the dry salt is left in the dish. Weigh the dish again and hence find the weight of the salt. Now using the unitary method find the amount of salt that will dissolve in 100 gram of water. Repeat the experiment each time finding the weight of dry salt. This is the solubility of the salt. (For details consult Textbook on Chemistry pages 92-93).

Observations :

Sr. No.	Weight of china dish m_1 gram.	Weight of dish + solution m_2 gram.	Weight of solution $(m_2 - m_1)$ gram.	After heating weight of dish + solution m_3 gram.	Weight of solute $(m_3 - m_1)$ gram.	Solubility $\left(\frac{m_3 - m_1}{m_2 - m_1} \times 100\right)$ gram.
1						
2						
3						

Precautions :

1. Heat salt so much that no water is left.
2. While making the solution keep it away from impurities.
3. While heating the dish care should be taken that it is not blackened from outside. Weigh it again after wiping away the suite in case it gets blackened.
4. Do not heat the solute when water has completely evaporated.

**Practical Work :**

- Find the solubility of
- (a) Sodium chloride (b) Potassium nitrate and
(c) Potassium chlorate.

QUESTIONS :

1. Distinguish between, solute, solvent and give example of each.
2. Define solubility.
3. What is the effect of temperature on the solubility of substances ?
4. If a solute releases heat while it is being dissolved in water, what is this reaction called ?
5. If a solute absorbs heat from outside while it is being dissolved in water, what is this reaction called ?
6. What is the effect of heat on the following salts :
 - (i) Sodium Chloride.
 - (ii) Potassium Nitrate.
 - (iii) Sodium Sulphate ?

EXPERIMENT 15

USING BOYLE'S LAW APPARTUS VERIFY BOYLE'S LAW

Description of Boyle's Law Apparatus

This apparatus is composed of two glass tubes mounted on wooden stands with clamps. These clamps can be moved up or down along the stands. One glass tube is closed at one end and open at the other while the other is open at both ends. Both the tubes are connected to one another with a rubber tube. A metre-rod is fixed vertically between the wooden stands as shown in the figure.

Method :

Level the base of the apparatus with a spirit level by using the levelling screws attached under the base. Pour mercury into the open tube with a funnel till the level of mercury in both the tubes is the same. This means that the pressure of air in the closed tube is equal to the atmospheric pressure.

$$\therefore P = A + h \quad \text{because } h = 0$$

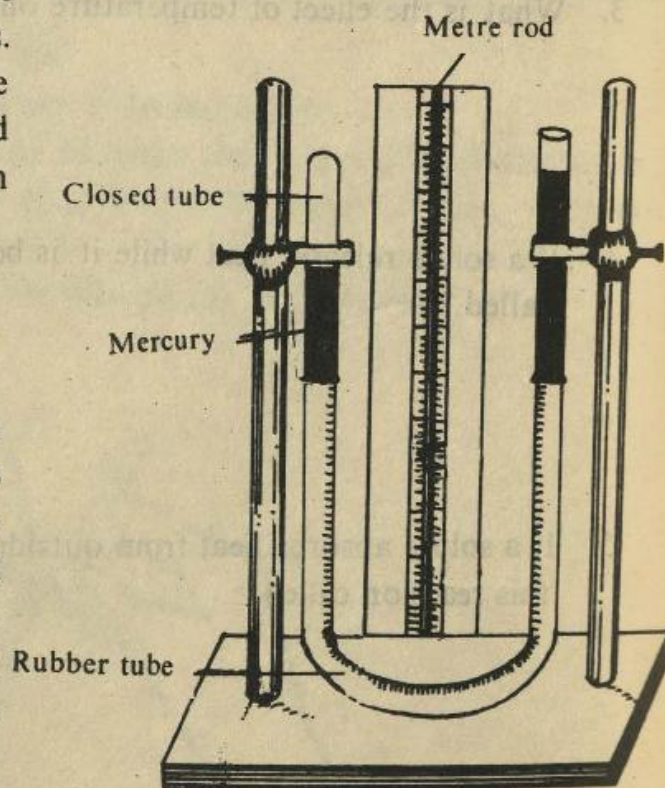
$$\therefore P = A$$

Pressure of atmosphere $\rightarrow A$

difference of mercury level between the two tubes $= h$

Pressure of air in the closed tubes $= P$

(For details please refer to Text-book of Chemistry page 63).



Find the atmospheric pressure with Fortin barometer. Find the pressure of air in the closed glass tube by metre-rod and set squares.

Now move the open tube downwards along the stand and clamp it there. Due to the increase of pressure the level of mercury in the closed tube will rise. Find the difference of level of mercury (h) in the two tubes and the volume of air in the closed tube with metre rod by set squares.

Now move the open tube upwards along the stand and clamp it there. The level of mercury in the closed tube will fall. Again find the difference of mercury level in the two tubes and the volume of air in the closed tube with metre-rod by set squares. Repeat the experiment three times.

Observations :

Sr. No.	Atmospheric Pressure = A	Difference of level of mercury in two tubes = h	Pressure of air in the glass tube $P = A + h$	Volume of air in glass tube = V	$P \times V = K$ K is constant.
1.					
2.					
3.					

Precautions :

1. Level the apparatus using levelling screws with a spirit level.
2. Note the level of mercury with set squares.
3. Move the open tube gently above or below.

QUESTIONS :

1. Define Boyle's law.
2. What is the difference between absolute temperature and the centigrade temperature? How can one be converted into other?
3. What is meant by standard temperature and pressure (S.T.P)?
4. Explain with examples what you mean by pressure and volume.
5. If the volume of the air increases what will be the effect on the pressure?

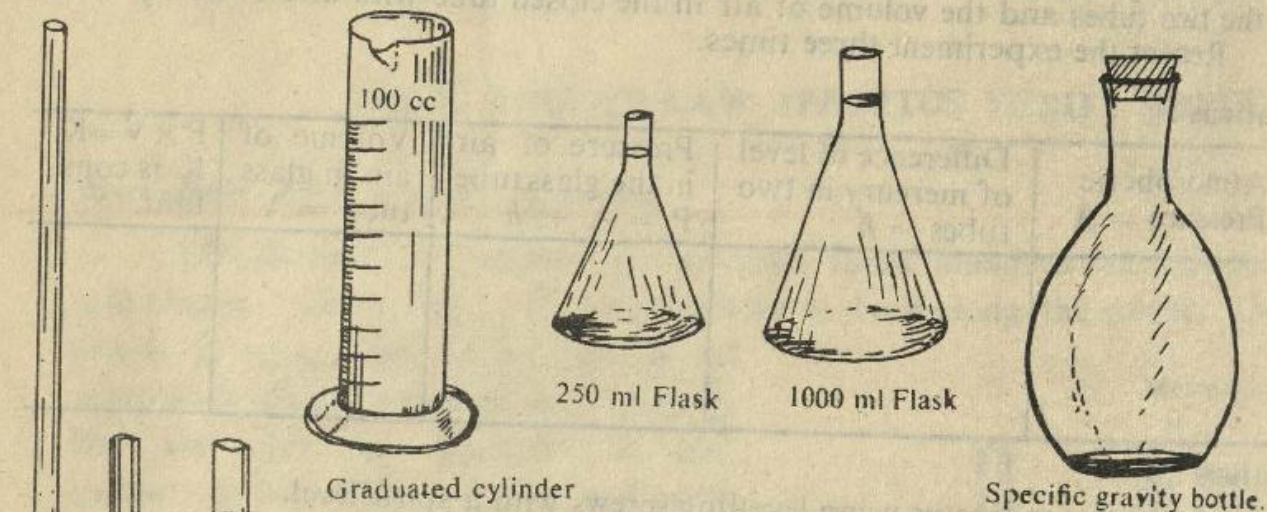
DIFFERENT METHODS OF FINDING THE VOLUME OF LIQUIDS

Method 1. With a Graduated Cylinder.

It is a glass cylinder having marks etched on it from 0–100 (as shown in figure). Each small division represents a milli-litre.

Method 2. With a graduated conical flask.

It is a long necked conical flask with a mark engraved on its long neck as shown in the diagram. The conical flask should be filled with liquid up to this mark. The volume of the flask is written on it e.g. 1000 ml, 500 ml etc.



Method 3. With a specific gravity bottle.

This is a glass bottle with volume written on it as shown in figure. The volume of the liquids is found with it and hence also the density or relative density of the liquids.

Method 4. With a pipette.

It is a long glass tube with one end open and the other end tapering into a jet. It has a bulb in the centre. The tube from the jet end is dipped into liquid and the liquid is sucked with mouth in the pipette to fill it up to a mark made near the end of the upper open end. The volume of the pipette is written on it.

Method 5. With a burette.

It is a long glass tube as shown in the figure. Divisions from 0 to 50 are engraved along it. Its upper end is open and the lower end is jet like to which a stop cork is attached. It is vertically mounted on a stand. Liquid is poured into it with a funnel from the upper open end. Liquid is used drop wise from the lower end with the stop cork. Generally acid is taken in the burette.

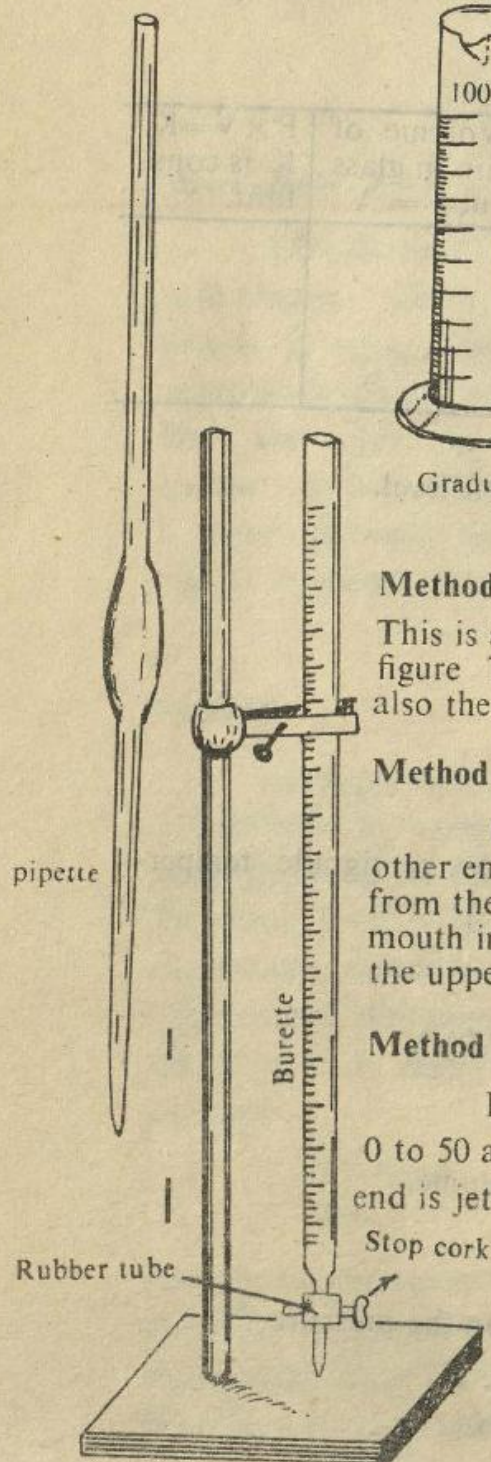


TABLE OF EQUIVALENT WEIGHTS

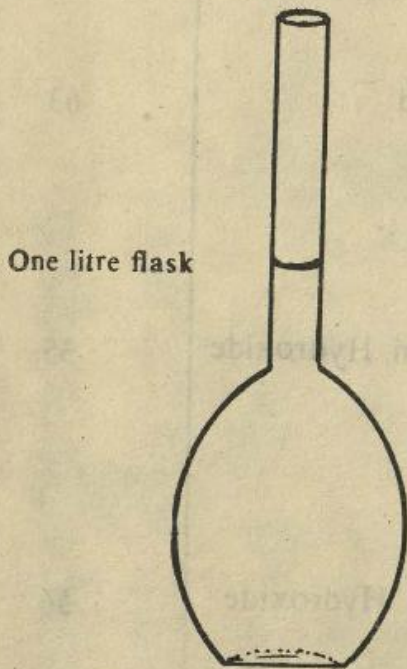
Name of the substance	Equivalent weight	Name of the substance	Equivalent weight
Acetic Acid	60	Citric Acid	70
Hydrochloric Acid	36.5	Oxalic Acid	63
Sulphuric Acid	49	Ammonium Hydroxide	35
Calcium Hydroxide	37	Potassium Hydroxide	56
Sodium Bicarbonate	84	Sodium Carbonate	53
Sodium Hydroxide	40		

EXPERIMENT 16

PREPARE 0.05 AND 0.1 MOLE SOLUTION OF SODIUM HYDROXIDE

Apparatus :

Conical flask, distilled water, beaker, chemical balance with weight box, sodium hydroxide.



Method :

The molecular weight of a substance in grams is termed one MOLE.

The solution which contains one mole of acid or base dissolved in one litre of solution is known as MOLAR SOLUTION.

A solution of an acid or a base which contains one equivalent weight in grams of a substance per litre of the solution is called NORMAL SOLUTION. NORMALITY of a solution is the number of equivalent weights dissolved in one litre of solution.

(For details refer to Textbook of Chemistry pages 118, 119)

Let us suppose a Normal Solution of NaOH is to be prepared.

Equivalent weight of NaOH = 40

If 40 grams of NaOH is dissolved in a flask of one litre capacity, a normal solution of NaOH is formed. If 0.1N solution is to be formed, then 4 grams of NaOH are dissolved in a flask of one litre capacity.

If a gram molar solution of NaOH is required to be formed, then 40 gram moles are dissolved in a flask of 1 litre capacity. This is the Molar Solution of NaOH.

For preparing 0.05 mole & 0.1 mole solution :

Amount of NaOH in grams per litre = $\text{Mole} \times \frac{\text{Gram}}{\text{Molecular weight}}$

$$= 0.05 \times 40 = 2.00 \text{ grams}$$

$$= 0.1 \times 40 = 4.00 \text{ grams}$$

Thus to prepare 0.05 mole solution of NaOH, 2 grams of NaOH are required to be dissolve to make one litre solution. To prepare 0.1 mole solution, 4 grams of NaOH are required to be dissolved to make 1 litre solution.

Precautions :

1. NaOH should be weighed in a watch glass.
2. NaOH should be handled with a spatula and not with hands.
3. Wash the watch glass with water and put the water in the flask.
4. Add some more water in the flask to completely dissolve NaOH. During the process of dissolving cool the flask with water.
5. When NaOH has completely dissolved add more water in the flask to fill it up to the mark on it.

Practical Work :

Prepare 0.05 & 0.1 mole solutions of

(a) HCl (b) Oxalic acid.

QUESTIONS :

1. Why should NaOH be not touched with hand ?
2. Why is the flask cooled during the process of dissolving NaOH ?
3. Why is shaking necessary ?
4. To prepare a dilute sulphuric acid, the acid is poured slowly and gently into water. Why is water not poured into acid ?

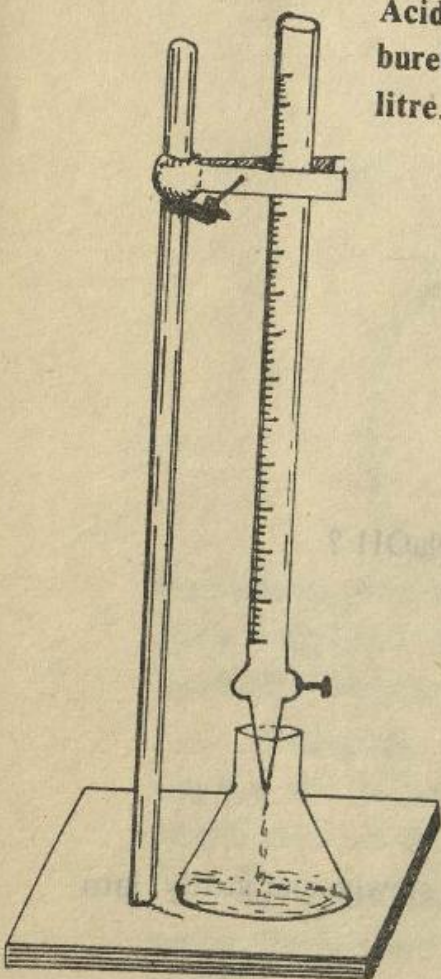
EXPERIMENT 17

ACID BASE TITRATION

Using Phenolphthalein and Methyl Orange as Indicators
perform Acid Base Titration

Apparatus :

Acid, alkali, indicators, (methyl orange, phenolphthalein), burette, pipette, stand, funnel, conical flask, beaker, flask of one litre.



METHOD :

After cleaning and drying the burette clamp it vertically with a stand. The graduation marks should face you. Put some 0.1N solution of acid in the burette with a funnel. Note the reading of acid level in the burette. Put some fixed alkali solution in a conical flask with a pipette. Add one or two drops of phenolphthalein in the flask so that the colour of alkali becomes light pink. Now place the flask under the burette. Add acid drop by drop in the flask and go on stirring it. When the pink colour of alkali just disappears, then stop adding acid in it. Note the level of acid in the burette again. The difference of two readings of the burette gives the volume of acid used for the fixed volume of alkali.

(For details refer-to Textbook of Chemistry pages 123, 124)

$$\text{Normality of Acid} = \frac{N}{10}$$

Observations :

Sr. No.	Volume of Alkali ml	Initial Reading of level in the burette ml	Final reading of level in the burette ml	Volume of Acid used V
1	10			
2	10			
3	10			

Calculations :

Acid Alkali

$$N_1 \times V_1 = N_2 \times V_2$$

$$\frac{N_1}{10} \times V_1 = N_2 \times 10$$

$$N_2 = \frac{N_1}{10} \times V_1 \times \frac{1}{10} \text{ where } N_2 = \text{Normality of Alkali}$$

Precautions :

1. Add acid slowly and go on stirring the flask.
2. Add a very little quantity (only one or two drops) of indicator.
3. Do not jerk or blow the solution out of the jet of the pipette if some solution sticks to the jet of the pipette.
4. If the solution in the burette is colourless, then its lower meniscus should be noted.

QUESTIONS :

1. What are the characteristics of acids ?
2. What is an indicator ?
3. What is meant by neutralization, explain it with examples ?
4. What are the characteristics of alkali ?
5. What is meant by Titration ?
6. If 10 ml of NaOH solution is required to neutralize 10 ml of 0.1N sulphuric acid, then find the normality of the alkali.
7. Why is alkali not taken in the burette ?

EXPERIMENT 18

SHOW THE EFFECT OF LITMUS ON SOME SOLUTIONS

Appartus :

Vinegar, Soap solution, Baking powder, Common salt, Detergent, Fresh milk, Sour milk. Test-tube, Test-tube stand, Beaker, Given solution, Litmus solutions (red & blue) or papers.

METHOD :

Take a little of each of the solution in test tubes. Add red and blue litmus in turn in each of the test tubes. The solution in which the blue litmus turns red is acid, while the solution in which red litmus turns blue is alkali. The solution which has no effect on any of the litmus is neutral.

Observations :

Sr. No.	Given Solution	Effect on		No effect on litmus	Nature of Solution
		red litmus	blue litmus		
1	Vinegar				
2	Soap Solution				
3	Baking Powder				
4	Table Salt				
5	Detergent				
6	Fresh Milk				
7	Sour Milk				

Precautions :

1. Add only a drop or two of the litmus in the test tube containing solution.
2. In case of a litmus paper wet the litmus paper before dipping it in the solution.

EXPERIMENT 19

TEST THE IONS OF SODIUM, POTASSIUM, BARIUM, STRONTIUM, AND CALCIUM IN THE FLAME OF A SIMPLE CANDLE

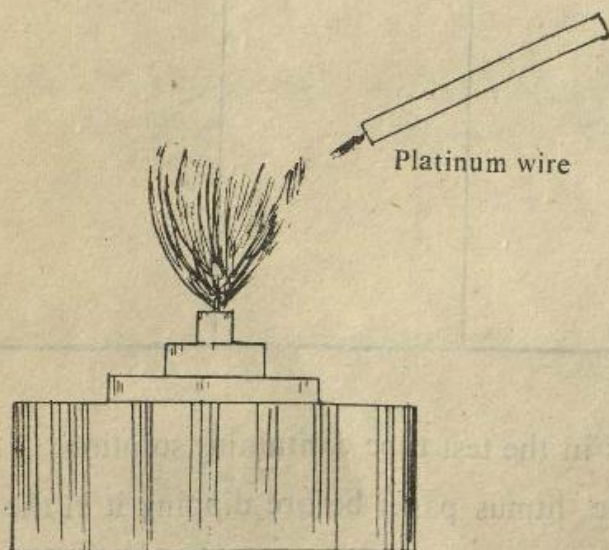
Apparatus :

Platinum wire, spirit lamp or candle, match box, nitric acid, hydrochloric acid, blue glass.

METHOD :

Wash the platinum wire thoroughly with nitric acid and dry it. Dip the wire in hydrochloric acid then put it in the ion powder so that the powder sticks to the wire.

Take Platinum wire with powder on it in the flame. See the colour of the flame with naked eye and through a blue glass. Record the observations as below :



Observations :

Ion of metals	Colour of the flame	
	With naked eye	Through blue glass
Sodium		
Potassium		
Strontium		
Barium		
Calcium		

Precautions :

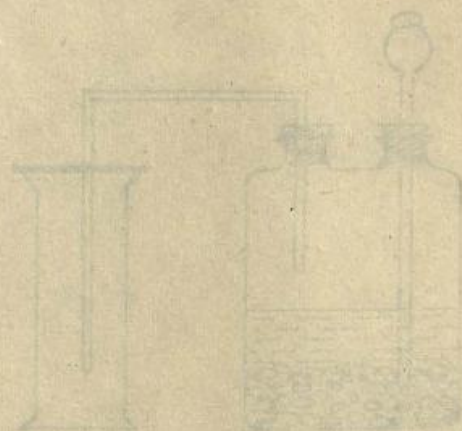
1. Platinum wire must be used. Do not throw the powder with hand in the flame to see the colour.
2. Wash the platinum wire thoroughly with nitric acid.
3. Use only the upper most part of the flame.

QUESTIONS :

1. Why is platinum wire used for identifying the ions of metals in a flame ?

2. What will happen if platinum wire is not cleaned ?

3. Why is blue glass used ?



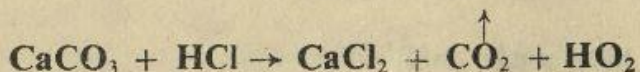
EXPERIMENT 20

PREPARE CARBON DIOXIDE GAS AND STUDY ITS PROPERTIES

Apparatus :

Wolf's bottle, cork, cork borer, thistle funnel, bent tube, cylinder, glass disc, marble pieces, HCl, lime water, candle, litmus (red and blue), match box, deflagrating spoon, plaster of Paris.

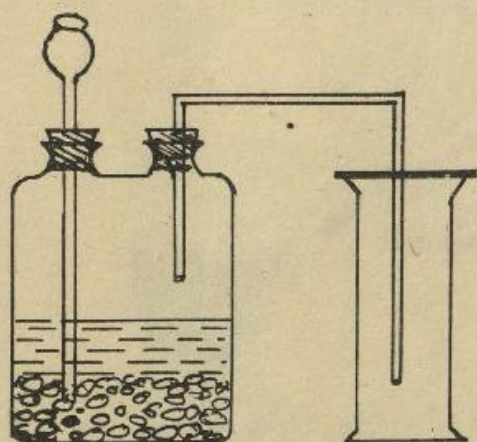
Chemical Reaction :



Calcium Carbonate + Hydrochloric acid $\rightarrow$ Calcium Chloride + Carbon dioxide + water

METHOD :

Take a Wolf's Bottle and put some pieces of marble into it. Through one mouth of the bottle pass a thistle funnel and through the other pass a glass tube bent twice at right angle as shown in figure. Thistle funnel and glass tube are passed through a tight fitting cork. Make the mouth air tight by wax. The other end of the bent tube enters through a disc into a glass jar. Through the funnel pour water on the marble pieces to dip them into water.



Marble pieces + Hydrochloric
acid

Now pour hydrochloric acid on the marble pieces through thistle funnel. Reaction will start at once and the gas will start accumulating in the jar. A burning match stick taken to the mouth of the jar will extinguish. This will show the presence of the gas.

Collect some jars in this way and keep them up right on the table.

(For details refer to Textbook of Chemistry page 166-168).

Precautions :

1. The apparatus should be air tight.
2. The end of thistle funnel should dip in water.
3. Wash the pieces of marble before putting in the bottle.

EXPERIMENTS WITH CO₂

Sr. No.	Experiment	Observation	Inference
1.	Look for the colour of gas in the cylinder, smell it and dissolve it to taste it.		
2.	Put wet, (red and blue) litmus paper in the gas jar.		
3.	Take a burning candle in the gas jar.		
4.	Invert the jar full of gas over an empty jar, after some time take burning candle near both the cylinders.		
5.	Add lime water in the gas jar and shake it.		
6.	What will happen if more gas is passed through milky water.		

QUESTIONS :

1. Why does lime water become milky when CO_2 gas is passed through it ?
Write the chemical equation.
2. What happens when CO_2 gas is further passed through milky lime water ?
Write the equation.
3. Why are the gas jars kept upright on the table ?
4. Can CO_2 gas be collected over water ? If not why ?
5. Can CO_2 gas be collected in the jar if one end of the bent tube is dipped in water ?

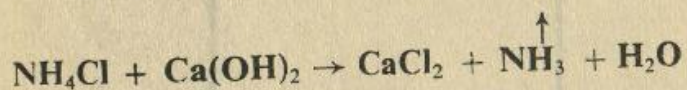
EXPERIMENT 21

PREPARE AMMONIA GAS AND STUDY ITS PROPERTIES

Apparatus :

Round bottom flask, Exit tube, Tripod, spirit lamp, gauze, match box, candle, cork, cork borer, cylinder, disc, stand, ammonium chloride, calcium hydroxide, litmus (red and blue), hydrochloric acid, turmeric paper, methyl orange, phenolphthalein.

Chemical Reaction.

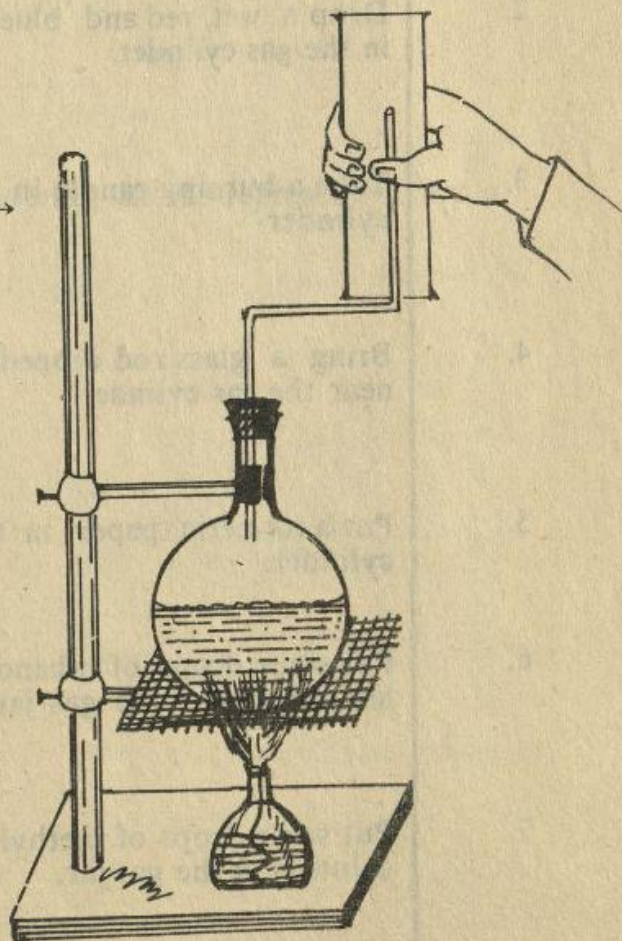


Ammonium Chloride + Calcium Hydroxide →
Calcium Chloride + Ammonia + Water.

METHOD :

Put ammonium chloride and dry lime in a clean flask. Fit an exit tube through a cork in the glass flask as shown in figure. Make the apparatus air tight. Heat the flask with a spirit lamp. Chemical reaction will start when heated. Gas will be collected through the exit tube in the inverted gas jar. Bring a drop of HCl acid near the mouth of the jar, if white fumes are produced the jar is full of gas.

Collect some jars of gas and place them inverted on the table.



Ammonium Chloride + Calcium Hydroxide

Precautions :

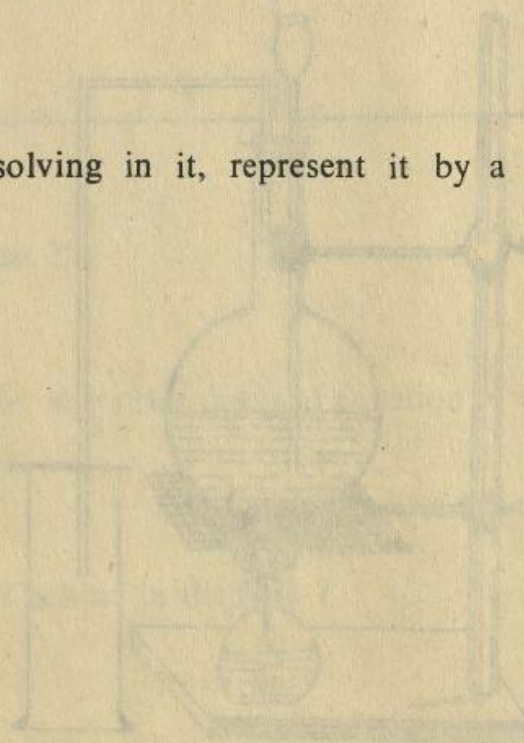
1. Use wax or plaster of Paris to make the apparatus air tight.
2. Place the gas jars inverted on the table.
3. Do not smell the gas too much.

EXPERIMENTS WITH AMMONIA GAS

Sr. No.	Experiment	Observation	Inference
1.	Look for the colour of the gas in the cylinder smell it and taste its solution in water.		
2.	Drop a wet, red and blue, litmus in the gas cylinder.		
3.	Take a burning candle in the gas cylinder.		
4.	Bring a glass rod dipped in HCl near the gas cylinder.		
5.	Put a turmeric paper in the gas cylinder.		
6.	Put some drops of phenolphthalein solution in the gas jar.		
7.	Put some drops of methyl orange solution in the gas jar.		
8.	Put copper sulphate solution in the gas cylinder.		

QUESTIONS :

1. Why is ammonia gas prepared by displacement of air.
2. Can ammonia gas be collected over water ? If not why not ?
3. Represent by a chemical reaction the white fumes produced by bringing hydrochloric acid near ammonia gas.
4. Ammonia reacts with water while dissolving in it, represent it by a chemical equation.



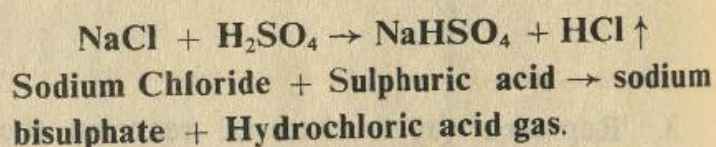
EXPERIMENT 22

PREPARE HYDROCHLORIC ACID GAS AND STUDY ITS PROPERTIES

Apparatus :

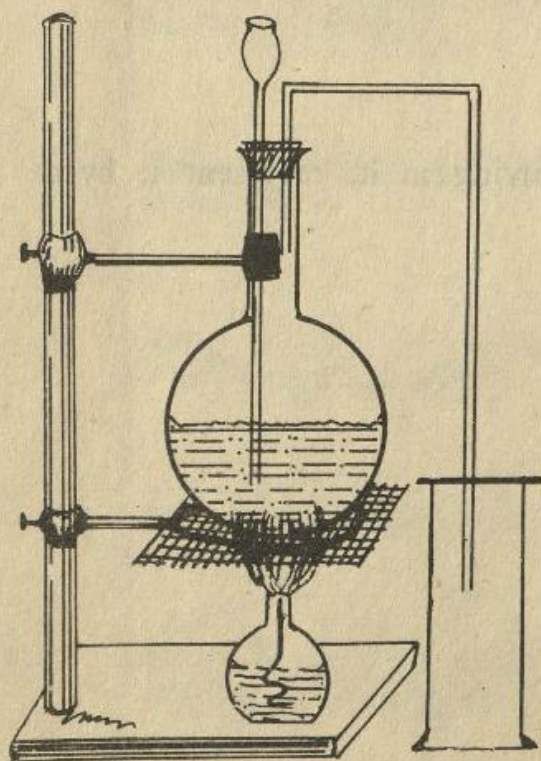
Round bottom flask, spirit lamp, match box, stand, bent tube, thistle funnel, guaze, cork, cork borer, disc, common salt, H_2SO_4 , litmus, silver nitrate, ammonia solution.

Chemical Reaction.



METHOD :

Take some common salt in a clean round bottom flask. Fit a cork in the mouth of the flask and pass a thistle funnel and a glass tube bent twice at right angle through the cork as shown in diagram. Insert the outer end of the tube in a dry glass cylinder with a disc over it. Put enough sulphuric acid in the flask through the funnel so that the lower end of the funnel dips into it. Heat the flask. Reaction will start and gas will collect in the cylinder. Bring a rod dipped in ammonia near the mouth of the cylinder, white fumes will be formed. Collect some more glass cylinders and keep them upright, with disc over them, on the table.



Common Salt + Sulphuric acid

Precautions :

1. The lower end of thistle funnel should dip in acid.
2. The apparatus should be air tight.
3. The cylinder for collecting gas must be dry.

(For details consult Textbook of Chemistry pages 224-226).

EXPERIMENT WITH HYDROCHLORIC ACID GAS

Sr. No.	Experiment	Observation	Inference
1.	Look for the colour of a gas in a jar full of gas. Smell the gas and taste it after dissolving it in water.		
2.	Put a litmus paper (red and blue) in the gas jar.		
3.	Take a burning candle in the gas jar.		
4.	Put silver nitrate solution in the gas jar.		
5.	Invert a jar full of gas over an empty jar, then test both the cylinder with litmus paper.		
6.	Take a drop of ammonia in the gas cylinder.		
7.	Put some water in the gas cylinder, shake it well and then put blue litmus into it.		

QUESTIONS :

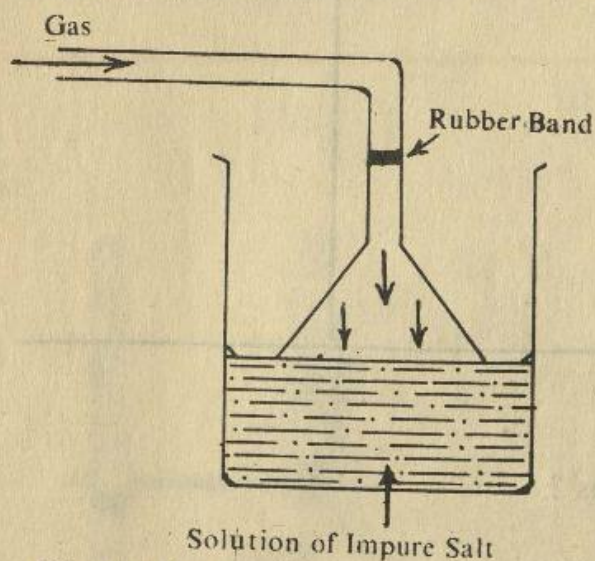
1. On solution what acid is made by this gas ?
2. What is the identification of chloride, write the chemical equation of the reaction ?
3. After the preparation of gas what is left behind in the flask ?
4. What are salts of this acid ?
5. Can this gas be collected over water ?

EXPERIMENT 23

PURIFY THE GIVEN IMPURE SODIUM CHLORIDE WITH HYDROCHLORIC ACID GAS

Apparatus

Apparatus of experiment No. 22 funnel, rubber stop cork, impure sodium chloride.



METHOD :

Dissolve about 10-15 grams of impure sodium chloride in minimum amount of water. Pass hydrochloric acid gas, as prepared in Experiment No. 22 through solution. Sodium chloride will begin to settle on the bottom of the beaker as HCl gas is passed. Continue this process till more sodium chloride settles on the bottom. Decant the solution and dry the sodium chloride so obtained on a filter paper and weigh it.

Observations :

Weight of impure sodium chloride	Weight of pure NaCl obtained	Difference	Amount per cent

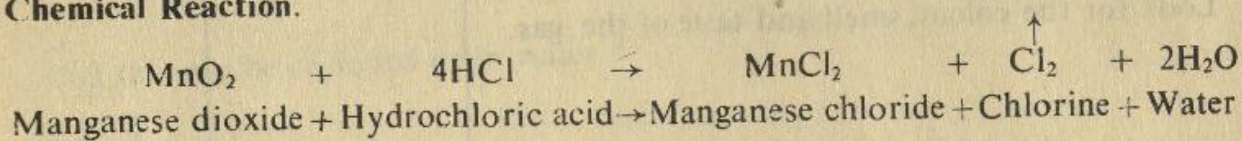
Precautions :

1. The tube attached to the rubber stop cork should not dip into the solution of impure sodium chloride.
2. Pass hydrochloric acid gas through the solution of impure NaCl and continue this till no more NaCl settles on the bottom of the beaker.

EXPERIMENT 24

PREPARE CHLORINE GAS IN THE LABORATORY AND STUDY ITS PROPERTY

Chemical Reaction.



Apparatus :

Round bottom flask, cork, cork borer, bent tube, cylinder, spirit lamp, match box, stand, disc, tripod, hydrochloric acid, manganese dioxide.

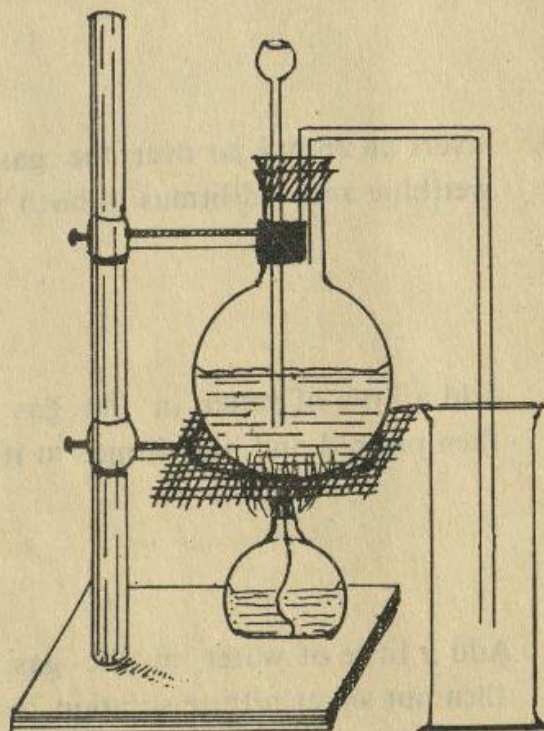
METHOD :

Take manganese dioxide in a clean round bottom flask and put concentrated hydrochloric acid in it through a thistle funnel fitted in the mouth of the flask as shown in figure. Make the apparatus airtight. Heat the flask gently. Greenish yellow gas will be collected in the cylinder. Bring a few drops of ammonia near the gas. The formation of white fumes indicate the presence of gas. Collect some jars of gas and place them upright on the table.

(For details refer to Textbook of Chemistry pages 221-223)

Precautions :

1. The apparatus should be absolutely airtight.
2. Collect gas in a dry cylinder.
3. Being a poisonous gas it should be prepared in a cupboard or in open airy space.



Manganese Dioxide + Hydrochloric acid

EXPERIMENT WITH CHLORINE GAS

Experiment	Observation	Inference
1. Look for the colour, smell and taste of the gas. 2. Put blue and red litmus in the gas jar. 3. Add a drop of ammonia in the gas jar. 4. Invert an empty jar over the gas jar and put wet (blue and red) litmus in both jars. 5. Add a little of water in the gas cylinder and then put red and blue litmus in it. 6. Add a little of water in the gas cylinder and then put silver nitrate solution in it.		

QUESTIONS :

1. Why is it necessary to prepare the gas in a cupboard or an airy space ?
2. Can this gas be collected over water ?
3. On dissolving gas in water what does it make ? Write the chemical equation.

EXPERIMENT 25

IDENTIFY CHLORIDE, BROMIDE AND IODIDE WITH EXPERIMENTS

Apparatus :

Given salts, test tubes, beaker, water, spirit lamp , match box, tripod, test tube stand, test tube holder, silver nitrate solution, manganese dioxide, sulphuric acid and carbon disulphide.

Method :

Take three test tubes and write A, B, C on them. Take some clean test tubes and put the salts in them. Add in each tube, silver nitrate, manganese dioxide, sulphuric acid and carbon disulphate. See the colour of the solution and record the observations as given below

OBSERVATIONS

Sr. No.	Reagents	Test tube			Inference from Test tube			Chemical Equation
		A	B	C	A	B	C	
1	Add Silver nitrate Solution							1 (a) $\text{AgNO}_3 + \text{NaCl} \rightarrow \text{AgCl} + \text{NaNO}_3$ 1 (b) $\text{AgNO}_3 + \text{NaBr} \rightarrow \text{AgBr} + \text{NaNO}_3$ 1 (c) $\text{AgNO}_3 + \text{NaI} \rightarrow \text{AgI} + \text{NaNO}_3$
2	Heat MnO_2 with H_2SO_4							2 (a) $2\text{NaCl} + 2\text{H}_2\text{SO}_4 + \text{MnO}_2 \rightarrow \text{Na}_2\text{SO}_4 + \text{MnSO}_4 + \text{Cl}_2 + \text{H}_2\text{O}$ 2 (b) $2\text{KBr} + 2\text{H}_2\text{SO}_4 + \text{MnO}_2 \rightarrow \text{K}_2\text{SO}_4 + \text{MnSO}_4 + \text{Br}_2 + \text{H}_2\text{O}$ 2 (c) $2\text{KI} + 2\text{H}_2\text{SO}_4 + \text{MnO}_2 \rightarrow \text{K}_2\text{SO}_4 + \text{MnSO}_4 + \text{I}_2 + \text{H}_2\text{O}$
3	Add solution of carbon disulphide and chlorine water							

EXPERIMENT 26

STUDY THE PREPARATION OF ALLOTROPIC FORMS OF SULPHUR AND THEIR PROPERTIES

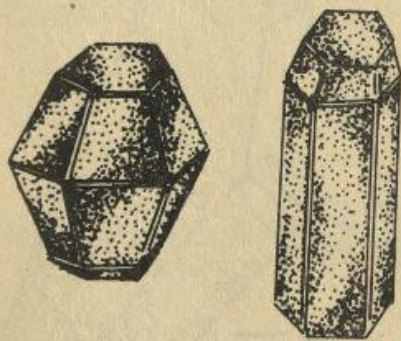
Apparatus :

Test tubes, test tube stand, test tube holder, china dish, spirit lamp, match box, beaker, water, guaze, tripod, carbon disulphide, toluene, pestal and mortar.

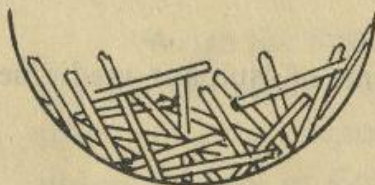
METHOD :

(a) Rhombic Sulphur

Take a test tube and put some powdered sulphur in it. Put some carbon disulphide in the test tube and shake it, so that all the sulphur dissolves. Now put this solution in a flat dish and place it in air. Carbon disulphide will evaporate leaving small crystals in the dish. They look octangular when viewed under a convex lens. (For details refer to Textbook of Chemistry pages 205 to 207).



Rhombic Sulphur



Monoclinic Sulphur

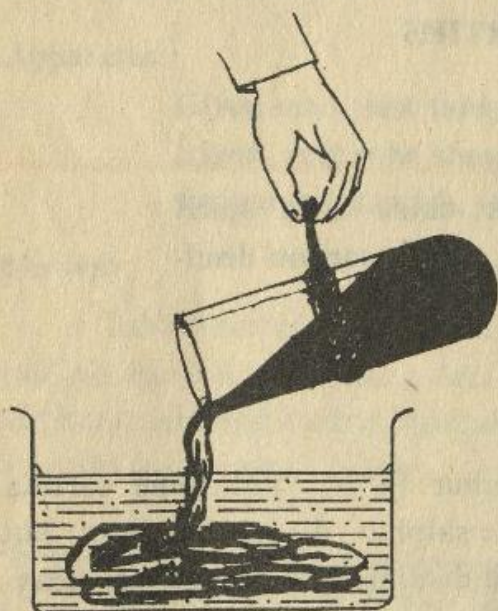


(b) Monoclinic Sulphur

Take some toluene in a test tube and put some powdered sulphur in it and heat till it begins to boil. Now let the test tube to cool gradually. On cooling beautiful crystals will be visible at the bottom of the test tube.

METHOD No. 2

Heat some powdered sulphur in a dish till it melts but does not boil. Let the molten sulphur cool. A membrane is formed on the surface. Make a small hole in the membrane and drain water out of it, beautiful crystals will be visible at the bottom of the dish.

**(c) Plastic Sulphur**

Take a test tube and put some powdered sulphur in it. Hold the test tube by test tube holder and heat it. When sulphur in the test tube begins to boil, pour it at once in cold water. It will acquire a soft plastic form like rubber.

Precautions :

1. Keep carbon disulphide away from fire.
2. To make plastic sulphur pour boiling sulphur in water.
3. Toluene is highly combustible, heat it with care.

QUESTIONS

1. What is meant by allotropy ?
2. What will happen if sulphur is burnt in air ?
3. What is the specific name of sulphur medicines ?
4. What are sulphur compounds known as ?
5. What are the uses of sulphur compounds ?

EXPERIMENT 27

VERIFY LAW OF CONSERVATION OF MATTER

Apparatus :

Flask, test tube, thread, cork, silver nitrate, hydrochloric acid, beaker, chemical balance and weight box.

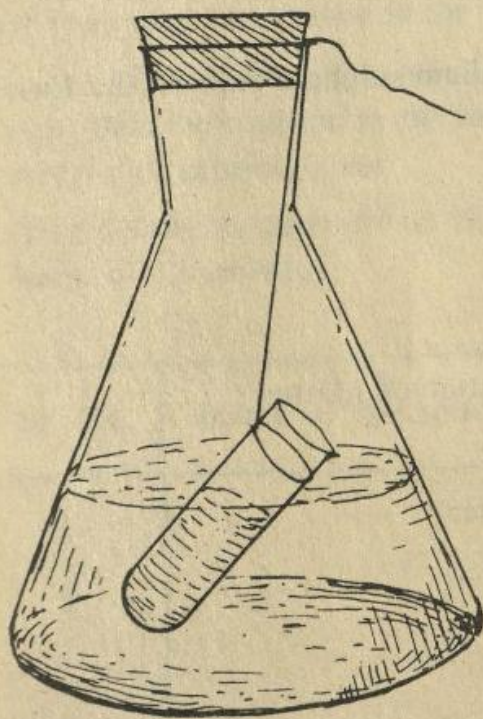
METHOD :

Take hydrochloric acid in a flask. Take some silver nitrate solution in a test tube. Tie the test tube with a thread and lower it in the flask with thread and cork the flask. Take care that the solution in the tube does not mix with HCl in the flask. Weigh the flask, the test tube, the cork and the liquids in them on a balance.

Now shake the flask so that the liquids get mixed up. Chemical reaction will take place in the flask.

Weigh the flask, the test tube, the cork and the liquids again. This weight will be the same as that before the chemical reaction took place. This proves the Law of Conservation of Matter.

(For details of observations refer to textbook of chemistry pages 26, 27).



OBSERVATIONS

Weight of flask + test tube + cork + liquids before the reaction starts	Weight of test tube + flask + cork + liquids after the reaction has taken place	INFERENCE

Precautions :

1. Take silver nitrate solution in a test tube and the thread tied to it should be so long that it hangs outside the flask.
2. Shake the solutions in such a way that no solution is lost.
3. Note the weights accurately.

Practical Work :

Taking the solutions of Barium chloride and Sodium sulphate explain the Law of Conservation of Matter.

QUESTIONS :

1. Define the Law of Conservation of Matter.
2. What is the practical advantage of Law of conservation of Matter ?
3. Who did discover the Law of Conservation of Matter ?
4. How is energy obtained from matter ?

EXPERIMENT 28

OBSERVATION OF CONDUCTIVITY

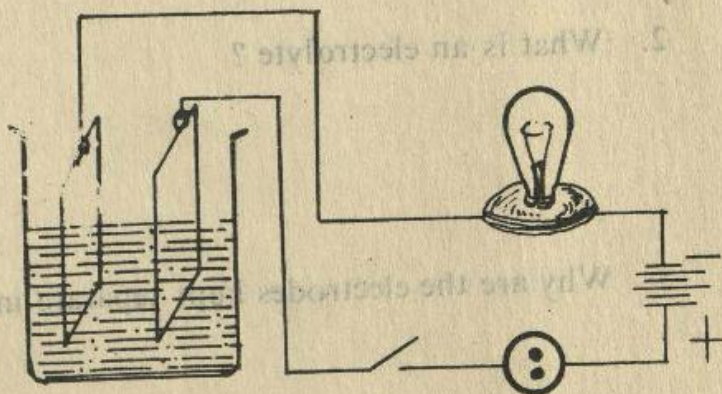
Observe the conductivity of Common Salt.

Apparatus :

Battery, beaker, electrodes, wires, bulb, given solution, key
voltmeter or ammeter.

METHOD :

Put the given liquid (solution of common salt) in a beaker and place two electrodes in it. Connect one electrode to a bulb which in turn is connected to one terminal of a battery. Connect the second electrode to an ammeter through a key and then to the second terminal of the battery as shown in the diagram.



If the bulb glows on closing the key, then the solution in the beaker is an electrolyte otherwise not.

(For details see pages 99 to 102 of Text-book of Chemistry).

OBSERVATIONS

Sr. No.	Name of the solution	Effect on Bulb	Inference
1			
2			
3			

Precautions :

1. The electrodes in the beaker should not touch one another.
2. The wire connections must be tight and clean.
3. Do not pass heavy current through the circuit

Practical Work :

Observe the conductivity of (a) Potassium Chloride (b) Ammonium Chloride (c) Sugar (d) Calcium acetate and (e) Acetic acid.

QUESTIONS :

1. What is meant by conductivity ?

2. What is an electrolyte ?

3. Why are the electrodes kept separate in a beaker ?

4. In which solutions can electrolysis take place ?

Sr. No.	Name of the solution	Effect on Bulb	Interference
1			
2			
3			

5. What will happen if the current is passed for a longer time ?

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قومی ترانہ

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